GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[x] ORIGINAL [ ] REVISION NO. _____

Project No. D-48-627 GTRI/~~GIT~~ DATE 6/ 13/ 84

Project Director: Anthony J. Bradshaw School/~~Dept~~ Architecture

Sponsor: State of Georgia; Department of Human Resources; Division of Rehabilitation Services

Type Agreement: Contract No. 427-93-40-666

Award Period: From 2/15/84 To ~~10/15/84~~ 4-15-85 (Performance) 11/10/84 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated:	$	$ 19,687.00
Funded:	$	$ 19,687.00

Cost Sharing Amount: $ n/a Cost Sharing No: _____

Title: "Development of a Personal, Portable Reading Machine for the Visually Impaired"

ADMINISTRATIVE DATA OCA Contact Lynn Boyd x4820

1) Sponsor Technical Contact:

Ms. Sandra C. Guthrie
Departmental Contract Coordinator
Office of Financial Services
Department of Human Resources
47 Trinity Avenue
Atlanta, GA 30334

2) Sponsor Admin/Contractual Matters:

Mr. Joe Patrick
Division of Vocational Services
State of Georgia; Dept. of Human Resources
47 Trinity Avenue
Atlanta, GA 30334
(404) 656-2480

Defense Priority Rating: n/a Military Security Classification: n/a
(or) Company/Industrial Proprietary: n/a

RESTRICTIONS

See Attached ----- Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with State of GA; DHR; howver, none is proposed.

COMMENTS:

Advance Project No. was assigned in the amount of $19,687.00.

JUN 1984 RECEIVED Research Reports Office

Sponsor I.D. #02.300.000.84.001

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FORM OCA 4:383

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 4/1/86

Project No. D-48-627 School/~~XXX~~ Arch.

Includes Subproject No.(s) N/A

Project Director(s) Tony Bradshaw GTRC / ~~GTI~~

Sponsor State of Georgia; Department of Human Resources; Division of Rehabilitation

Title "Development of a Personal, Portable Reading Machine for the Visually Impaired"

Effective Completion Date: 4/15/85 (Performance) 5/10/85 (Reports)

Grant/Contract Closeout Actions Remaining:

- [X] None
- [ ] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other _____

Continues Project No. _____ Continued by Project No. _____

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Form OCA 60:1028

Center for Rehabilitation Technology

College of Architecture
Georgia Institute of Technology
Atlanta, Georgia 30332

(404) 894-4960

DEVELOPMENT OF A PERSONAL, PORTABLE READING MACHINE FOR THE VISUALLY IMPAIRED

Final Report

DHR Contract #427-93-40-666
Georgia Tech Contract #D48-627

Project Goals

The purpose of this project was to initiate development of an affordable, portable reading machine for the blind and the severely visually impaired. The project was proposed as a two phase development program. This contract is for Phase A - Exploratory Prototype. The goal for this phase was to produce a "bread board" prototype. The prototype was to consist of a hand held optical scanner, a character recognition processing computer, and a speech synthesis module.

Other goals were to perform human factor studies on the blind population in order to house the machine in a functional, easy to use package. Another goal was to survey existing technologies that were transferable to the reader in order to keep development and production costs to a minimum.

Due to the failure of our prime electronic subcontractor, Lane L. Fowler, to perform adequately, a working prototype was not completed under this contract. However, information obtained during the course of this project was directly applied to the successful reading machine prototype for DRS client Ken Strozier in October 1985.

Summary of Objectives and Work

The following is a point by point analysis and summary of CRT's proposed statement of work and resultant work.

1) Design and build hand-held optical scanner; test and refine. - Subcontractor reports experimentation with Micron Technology's IS32 Optic Ram chip for use as the electronic "eye." Descriptions for use of this chip as an optical scanner were published in the Sepember 1983 issue of Byte magazine. He relates difficulties in interfacing optical data to a processing computer (Fairchild F9445 CPU). No other details of development were provided to Georgia Tech.

2) Design and build character recognition processing computer; test and refine. - The subcontractor reported that he was building the processing computer based on the Fairchild F9445 CPU, a Motorola MC6801 8 bit micro-computer, and a Zilos Z80B. He reported difficulties with interlinking the devices to each other. These components were not delivered to Georgia Tech. No further documentation was provided.

3) Design and build speech synthesis module; test and refine. - The subcontractor reports that he prototyped a voice synthesizer based on the SSI 263 voice chip. He provided A. J. Bradshaw a tape of the resultant synthesized voice. The subcontractor was informed that the speech quality was inadequate and inferior to inexpensive off the shelf synthesizer boards. This meeting was the last contact with the subcontractor.

4) Perform human factor studies of end-user population and determine parameters for complete unit design. - CRT personnel performed an exhaustive literature search on reading machines. CRT also interviewed Georgia Tech faculty with experience in optical recognition to determine technical feasibility related to reading machine size and cost. Blind individuals were interviewed at Atlanta Area Services for the Blind. DRS counselors who deal primarily with the blind were consulted for their recommendations. An engineer who had worked wih Telesensory Systems during a similar VA sponsored research project was interviewed for recommendations and insights on the difficulties encountered during that completed but unsuccessful project.

The above information was assembled for the unit's system design. This information was later applied to the aforementioned project for Kea Strozier.

5) Design and building housing and controls for electronic components; test and refine. Due to the failure of the subcontractor to deliver the electronic assembly, CRT had nothing to package, test, or refine.

Non-Performance of Subcontractor

From the above summary, it is apparent that this project was compromised by the failed performance of the subcontractor, Lane L. Fowler.

Mr. Fowler was selected as the subcontractor primarily due to his successful performance with a software modification project for Georgia Tech/DRS. In that project, Mr. Fowler was able to modify and write software that enables a blind person to operate Lanier Word Processing equipment by speech output. He accomplished the task at a much cheaper price than compared to other internal and external engineering estimates.

His price estimate for this project was considered low and was much less than the Georgia Tech electrical engineering personnel cost. (DRS could not afford the project using Georgia Tech electrical engineering.)

Therefore, based on prior performance and a low cost estimate, Mr. Fowler was awarded a subcontract. Attached please find copies of all documents delivered to Georgia Tech by Mr. Fowler.

The last contact CRT has had with Mr. Fowlr was September 15, 1984. He has since not responded to repeated phone calls or certified mail. The Georgia Tech Legal office (see attachments) is pursuing legal recourse.

Mr. Fowler billed and was paid $3,471 for labor, equipment, and shop cost from June 1984 through Sepember 13, 1984. The contract was cancelled when Mr. Fowler refused to correspond with Georgia Tech. Mr. Fowler has not turned in purchased or prototyped equipment as per subcontract requirements.

Conclusion

This project succeeded in initiating research that has since lead to the successful development of a portable reading machine for the blind (see attached color photocopy). The failure of the subcontractor delayed our progress, but the goal was subsequently met with the prototyping of Kea Strozier's machine. Legal

procedures have been initiated to resolve any improprieties related to the contract.

Information assembled during the course of this project was utilized in the subsequent reading machine project and relieved that project of the costs and time associated with the product research.

AJB:ac

Attachments

Lane L. Fowler
110 Oak Terrace
Lawrenceville GA 30245

December 14, 1983

Anthony J. Bradshaw
Center for Rehabilitation Technology
College of Architecture
Georgia Tech
Atlanta GA 30332-0156

Dear Mr. Bradshaw:

Lane L. Fowler proposes to do the following work on a contract basis for the Center for Rehabilitation Technology.

This work consists of a computer which will act as an optical scanner. The computer with adequate software, not provided, will become an optical character recognition system.

The computer shall be portable, and have the capabilities of voice synsthesization. The computer shall also be expandable for device and memory.

The work will entail:

Engineering cost (125 @ $36.00).....	4500
Shop Cost.....	600
Special equipment.....	1000
Prototype cost.....	550
Parts (not covered in shop cost).....	710
	$ 7360

This proposed budget is on a pay monthly basis. The duration of the project will be eight months. After completion of the project, full plans and the first production run will be given to the Center for Rehabilitation Technology for their discretion.

Sincerely,

Lane L. Fowler

Lane L. Fowler
110 Oak Terrace
Lawrenceville, Ga.
30245

July 18, 1984

Anthony Bradshaw
Georgia Tech
CRT
College Of Architecture
Atlanta Ga 30332

Dear Mr. Bradshaw

This report is for the month of July, one month into the project.

During the past several weeks I have been doing research with the cameria element and trying to work out the bus for the Fairchild F9445 CPU which is to be the heart of the project. I have incountered several problems. The main problem involves the image cameria. There are just over 16,000 elements in the cameria which are to sent to the computer for processing at least four times a second. The problem involves the time it takes to transmit the data from the cameria to the CPU, the CPU does not have the time to wait for this data nor there may not be enoush time to receve all the data from the cameria. The soluation is to: One, not read all the data from the cameria, just read every other element or just read a few verical lines of elements which should give sufficent resulation for the CPU to process the image. Two, would use an additional CPU like a Motorola 6801 to receve the data and store it into memory for later use by the F9445. Both of these soluations could be used to improve the speed of the project.

The second problem has to do with the F9445 bus system. A bus is the word used to discribe the interlinking of devices to the CPU which enables then to communicate to each other. The problem involves the memory used to store the data from the image cameria due to funny timing and structure of the bus the memory is selected is 32k byte seements, which is very strange to the common world of micro computers. I have not come up with a soluation to solve the strange bus problem with the F9445. At this time there seems to be needed 3 CPU's for Cyclops to peform a it's best, a 6801 to handle the input of the data from the cameria , the F9445 to handle the processing of the data, and a Zilog Z80B to handle the output of the data from the F9445 to the speech device, internal or external. This lists the progress and problems of the project to this date.

Sincerely,

Lane L. Fowler
Inclosed: invoice for July.

Lane L. Fowler
110 Oak Terrace
Lawrenceville, Ga.
30245

July 18, 1994

Anthony Bradshaw
Georgia Tech
CRT
College Of Architecture
Atlanta Ga 30332

Dear Mr. Bradshaw
This is the INVOICE for the months of July.

This Invoice is from 15 June to 15 July.

Labor:
Research on cameria and research on the F9445 CPU.
27 Hours @ 36.00 per hour 972.00

Total..... 972.00

	Equipment	Shop Cost	Labor
June	550.00	325.00	504.00
July	000.00	000.00	972.00

Sincerely,

Lane L. Fowler

1110 Oak Terrace
Lawrenceville GA.
30245

September 15, 1984

Mr. Anthony J. Bradshaw
Georgia Tech
Center for Rehabilitation
Technology
College of Architecture
Atlanta GA. 30332

Contract: 1-D-48-627

Dear Mr. Bradshaw,

During the last month I have been doing research with the image cameria. The following report is the work done during this time period.

The heart of the cameria unit is the optic chip. The chip was developed and is manufactured by Micron Technology, inc. The optic chip is composed of 65,537 individual image sensing elements called pixels. These pixels are organized into two rectangles (often referred to as arrays) of 128 by 256 pixels each. All thought Cyclops will only use one array, the image (in our case a character) is focused onto the optic chip, a digital representation of the image is "exposed" on the optic chip, the the image is transmitted to Cyclops and stored into the main memory area and processed by the Main processor.

Several problems arose, the major being a consern for the time (speed) it took to transmit a image from the cameria to the main memory. At the beginning of the test the maxiam speed of the chip prohibited me to transmit a image several times a second. But I was able to increse the speed of the chip to a range of 153600 bits per second which will allow a fair image to be exposed and transmitted in about 200 millaseconds.

The cameria will have to be connected to a input computer to better handle the data and better use the time to process the information already receved. There are two options which can be used. The first is to use a Motorola MC6801 which is a full 8 bit micro computer in a 40 pin package, the 6801 has a 13pin I/O port built into the package which will allow direct connection to the processor and little interfaceing will be required.

The second choise is to use a Zilos Z-80 central processing unit (CPU), Whic is a widely used CPU in the industry this chip does not have the atvantage of a built-in port but it is more powerful in software development.

The pocesso will be connected to the master bus system of Cyclops CPU system. The cameia processor will load the data directly into the pasing memory used by the Fairchild F9445 so the cameria (sub-)processor may load the data into the memory

while the F9445 is processing previously loaded data by the sub-processor and not be interupted by the loading of the image data.

The voice for Cyclops is a very simple voice synthesizer (to me that is, it is simple to use but very advanced). The main component is the SSI 263 it is a high quality voice chip. I have created a simple rules table for the 6502 and will try to convert it to a Zilog Z-80 which will be the main output processor of Cyclops it will switch between a RS-232C output and the internal voice synthesizer. I have added all the rules I could find but I have not been able to match the quality of the Echo or higher priced voice boxes.

The next period will be spent on the memory of the Fairchild F9445 and the power supply of Cyclops.

110 Oak Terrace
Lawrenceville Ga.
30245

September 14, 1984

Mr. Anthony Bradshaw
Center for Rehabilitation Tech.
College of Architecture
Georgia Tech
Atlanta Ga. 30332

RE: Invoice nos. 18. to Sept. 14

Dear Mr. Bradshaw.

This invoice is for the month of September. It covers work and supplies purchased from Aug. 18. to Sept. 14. 1984.

Work includes the hardware research of the voice synthesizer and the image cameria.

Hours Worked	20
at 36.00 per hour	720.00
Equipment	275.00
Shop cost	125.00
Total	
For the month of September	1120.00

NO invoice was turned in due to lack of funds and trust of being reimbursed by CRT and Georgia Tech. I hope this problem has been solved.

Sincerly.

Lane L. Fowler

XPENCES FOR CONTRACT 1-D-48-627	JUNE	JUNE	SEPT
OURS SPENT ON HARDWARE @ 36.00	14	27	20
NDOR COST	504.00	972.00	720.00
QUIPMENT REIMBURSABLE	550.00		275.00
HOP COST	325.00		125.00
ISC. NON CATALOGABLE PARTS			
OTAL COST SENT TO TECH	1379.00	972.00	1120.00

Georgia Institute of Technology
A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA
ATLANTA, GEORGIA 30332

OFFICE OF CONTRACT ADMINISTRATION

Telex 542507 GTRIOCAATL
Fax (404) 894-3120
Phone (404) 894-6921

April 5, 1985

CERTIFIED - Return Receipt

Mr. Lane Fowler
110 Oak Terrace
Lawrenceville, GA 30245

Subject: Subcontract No. 1-D-48-627

Dear Mr. Fowler:

Mr. Anthony Bradshaw, Georgia Tech's project director for the subject project, has informed me that work has not been completed on the optical character recognition system. He has also indicated that he has been unsuccessful in his numerous attempts to contact you. The date for completion of the work has passed, and we need to confer with you as soon as possible.

Please contact either myself or Mr. Bradshaw at once so that we may resolve this matter.

Very truly yours,

Michael V. Drew
Assistant Legal Officer

MVD:bns

xc: Anthony Bradshaw, Arch

GEORGIA TECH 1885-1985

DESIGNING TOMORROW TODAY

Office of Contract Administration
Centennial Research Building
Atlanta, Georgia 30332-0420
(404) 894- 4812

TELEX: 542507 GTRC OCA ATL
FAX: (404) 894-3120

October 19, 1985

Mr. Henry Neal
Board of Regents of the
University System of Georgia
244 Washington Street, S. W.
Room 460
Atlanta, Georgia 30334

Subject: Non-performing Subcontractor

Dear Mr. Neal:

By this letter I am referring to the Board of Regents a matter concerning Georgia Tech and Mr. Lane L. Fowler. Mr. Fowler was engaged as a subcontractor to Georgia Tech for work undertaken by Tech for the Georgia Department of Rehabilitation Services.

Mr. Fowler's contract was for the period of March 1, 1984, through October 15, 1984. Mr. Fowler was to design and construct a device to act as an optical scanner. He was to be compensated at the rate of $36.00 per hour for up to 125 hours, or $4,500.00. In addition, he was to be reimbursed construction costs in an amount not to exceed $2,865.00.

During the period of the agreement, Mr. Fowler was paid $3,471.00. Approximately 60% of this amount was for personal services, and the remainder for equipment and shipping costs. Sometime after payment, Mr. Fowler became inaccessible. He was last spoken to by Mr. Anthony Bradshaw, the principal investigator for the project, in December, 1984. Repeated attempts to contact Mr. Fowler by telephone have proved fruitless. A certified letter to his last known residence was returned unclaimed.

Mr. Bradshaw has indicated that he spoke with Mr. Fowler's father on one occassion while trying to contact the son. I am told that his father has encouraged Lane to contact us and resolve the situation, but to no avail.

At this point, we feel that Tech has no recourse but to attempt by legal means to regain the $3,471.00 paid to Mr. Fowler. Your advice or referral of this matter to the Attorney General's office would be greatly appreciated.

Very truly yours,

Michael V. Drew
Legal Officer

MVD:bns

cc: A. Bradshaw